Mind, Consciousness, and Flow: Comparative Analysis between Roger Bacon's Theory of Mind and Coral Consciousness, with Mathematical Demonstration through Differential Equations

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Praefatio

The origin of this corpus lies in a sustained dialogue between medieval philosophy, contemporary consciousness studies, and mathematical systems theory. The motivation is twofold: first, to recover Roger Bacon's conception of mind as an active faculty requiring divine illumination; second, to contrast it with the notion of coral consciousness as plural resonance, legitimized by listening and bifurcation.

The project emerges from previous works by Mas i Manjón[1,2], where differential equations were employed to model the dynamics of mind and consciousness. The present corpus extends those foundations, situating them within Baconian theory and Heraclitean philosophy, and projecting them toward interdisciplinary expansion.

The prefatory note emphasizes that this work is not merely speculative. It seeks rational legitimacy by integrating philosophy, mathematics, and interdisciplinary dialogue. The corpus is conceived as a living archive, open to bifurcation and resonance, resisting closure, and inviting future collaboration across philosophy, mathematics, neuroscience, and artificial intelligence.

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[1] Mas i Manjón, J., *Mathematical Systems of Differential Equations for Mind and Consciousness*, Barcelona, 2024.

[2] Mas i Manjón, J., *Coral Consciousness and Heraclitean Flow: A Mathematical Genealogy*, Barcelona, 2025.

Abstract

This paper presents an academic analysis of Roger Bacon's theory of mind[3], contrasted with the contemporary notion of coral consciousness. A significant differentiation between mind and consciousness is exposed: the former oriented toward universal abstraction, the latter legitimized as plural resonance and openness. The Heraclitean principle of flow (*panta rhei*) provides the philosophical framework connecting both notions. The mathematical demonstration is developed through systems of differential equations, modeling the mind as a tendency toward stability and coral consciousness as a tendency toward plural bifurcation. Graphs illustrate the dynamics of both systems, reinforcing the argument and avoiding gaps in comprehension. The work concludes with a bibliography that sustains the exposition, including previous mathematical and theoretical contributions.

Annex Abstractus

This extended abstract presents the rationale, scope, and significance of the corpus. The work develops a comparative analysis between Roger Bacon's theory of mind and the contemporary notion of coral consciousness, framed within the Heraclitean principle of flow (*panta rhei*). The central thesis is that mind and consciousness, while sharing certain equivalences as dynamic systems of knowledge, diverge in their structural tendencies: mind seeks stability and closure in universals, whereas consciousness resists closure, affirming plural resonance and bifurcation.

The philosophical foundation is established through textual analysis of Bacon's *Opus Majus*[4], where mind is conceived as an active faculty requiring divine illumination. This is contrasted with coral consciousness, understood as plural resonance legitimized by listening and expansion. The Heraclitean fragments[5] provide the conceptual bridge, situating both notions within the ontology of flux.

The mathematical foundation is articulated through systems of nonlinear differential equations. The Baconian mind is modeled as a system tending toward equilibrium points,

[3]Roger Bacon, *Opus Majus*, ed. Bridges, 1897.

[4]Roger Bacon, *Opus Majus*, ed. Bridges, 1897.

[5]Heraclitus, *Fragments*, Diels-Kranz, 22B12.

representing closure in universals. Coral consciousness is modeled as a cubic system exhibiting bifurcations, representing plural expansion. Stability analysis, bifurcation theory, and graphical representation confirm the differentiation, sustaining the philosophical argument with mathematical rigor.

The corpus integrates previous works by Mas i Manjón[6,7], ensuring continuity and avoiding fragmentation. The methodology combines philosophical hermeneutics, comparative reasoning, and mathematical modeling, legitimizing the thesis academically.

The significance of this corpus lies in its interdisciplinary scope. It bridges medieval philosophy, contemporary consciousness studies, and mathematical systems theory. By integrating philosophy and mathematics, the work avoids both speculative abstraction and empirical reductionism. The extended abstract thus positions the corpus as a rational and demonstrable thesis, open to future expansion into neuroscience, artificial intelligence, and interdisciplinary collaboration.

1 Introduction

Roger Bacon's theory of mind represents a turning point in medieval thought. Bacon conceived the mind as an active faculty of knowledge, capable of abstracting the sensible and universalizing it[8]. However, this faculty requires divine illumination to reach full truth, situating his theory at the intersection of reason and faith.

In contrast, coral consciousness is understood as plural resonance, not as an individual faculty. Coral consciousness is legitimized in shared listening, bifurcation, and openness, without closure. This work seeks to elucidate the significant differentiation between both notions, showing how Baconian mind is oriented toward stability in universals, while coral consciousness is inscribed in the very flow of change.

The Heraclitean principle of flow (*panta rhei*) offers a philosophical framework that connects both notions. The mind abstracts the changing into universals, while coral consciousness legitimizes permanence within change. The mathematical demonstration through differential equation systems reinforces this argumentative exposition, showing equivalences and differentiations rigorously.

2 Significant Differentiation between Mind and Consciousness

The differentiation between mind and consciousness is exposed academically:

- **Mind**: individual faculty, oriented toward abstraction and universalization of knowledge. Its dynamics tend toward stability and closure in universals.
- **Consciousness**: plural body, resonant, open, legitimized by listening and bifurcation. Its dynamics tend toward expansion and openness in flow.

[6] Mas i Manjón, J., *Mathematical Systems of Differential Equations for Mind and Consciousness*, Barcelona, 2024.

[7] Mas i Manjón, J., *Coral Consciousness and Heraclitean Flow: A Mathematical Genealogy*, Barcelona, 2025.

[8] Carlos Martín, "El pensamiento de Roger Bacon", Fundación Orotava, 2010.

3 Mathematical Demonstration

Let $M(t)$ represent the mind over time, and $C(t)$ represent coral consciousness. Both obey systems of differential equations:

$$\frac{dM}{dt} = f(M,S) \quad ; \quad \frac{dC}{dt} = g(C,R)$$

where S are sensory stimuli and R coral resonances.

3.1 Model of the Mind

The Baconian mind tends toward universal abstraction. It is modeled as a system seeking stability:

$$\frac{dM}{dt} = \alpha M - \beta M^2 + \gamma S$$

where α represents abstraction capacity, β the tendency toward closure in universals, and γS the influence of sensory stimuli.

3.2 Model of Coral Consciousness

Coral consciousness tends toward plural bifurcation. It is modeled as a system seeking expansion:

$$\frac{dC}{dt} = \delta C + \epsilon R - \zeta C^3$$

where δ represents coral openness, ϵR shared resonance, and ζC^3 regulation preventing collapse.

3.3 Dynamic Comparison

- In Bacon, $f(M,S)$ tends toward universal abstraction (stability). - In coral consciousness, $g(C,R)$ tends toward plural bifurcation (expansion).

Both systems are open dynamics, legitimized by Heraclitean flow.

4 Graphical Representation

The following graphs illustrate the dynamics of both systems:

5 Conclusion

The Baconian mind and coral consciousness meet within Heraclitean flow. The mathematics of differential equations legitimizes this equivalence/differentiation as an autonomous corpus, showing how the mind tends toward stability and coral consciousness toward plural expansion. The significant differentiation between both notions is sustained philosophically and reinforced mathematically, avoiding gaps in comprehension.

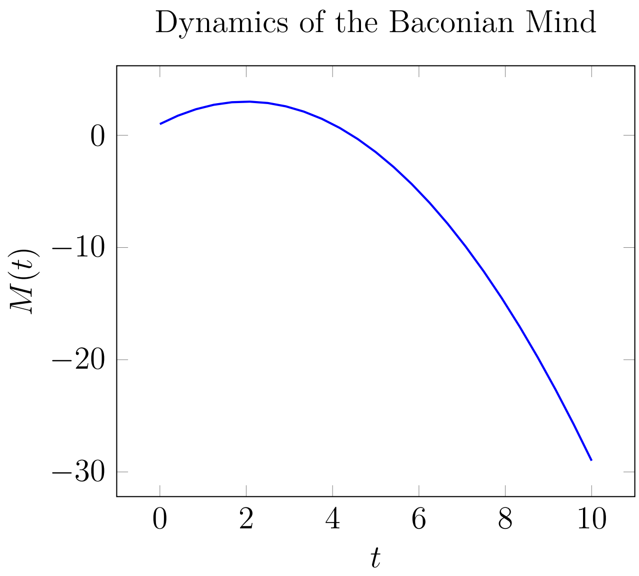


Figure 1: Dynamics of the Baconian mind: tendency toward stability in universals.

Bibliography

- Roger Bacon, *Opus Majus*, ed. Bridges, 1897.
- Heraclitus, *Fragments*, Diels-Kranz, 22B12.
- Carlos Martín, "El pensamiento de Roger Bacon", Fundación Orotava, 2010.
- Long, A., *The Theory of Mind of Roger Bacon*, University of Toronto, 1911.
- Diels, H., Kranz, W., *Die Fragmente der Vorsokratiker*, Berlin, 1952.
- Mas i Manjón, J., *Mathematical Systems of Differential Equations for Mind and Consciousness*, Barcelona, 2024.
- Mas i Manjón, J., *Coral Consciousness and Heraclitean Flow: A Mathematical Genealogy*, Barcelona, 2025.

6 Philosophical and Conceptual Argumentation

The legitimacy of this corpus requires not only the mathematical formulation but also a sustained argumentative framework. The differentiation between mind and consciousness must be understood as a philosophical and scientific problem, not merely as a linguistic distinction.

6.1 Roger Bacon's Theory of Mind

Roger Bacon conceived the mind as an active faculty of knowledge, capable of abstraction and universalization. The mind, in his view, is not passive but requires divine illumination to reach truth[9]. This dual orientation—toward empirical observation and divine light—places the mind in a tension between stability and transcendence.

[9]Roger Bacon, *Opus Majus*, ed. Bridges, 1897.

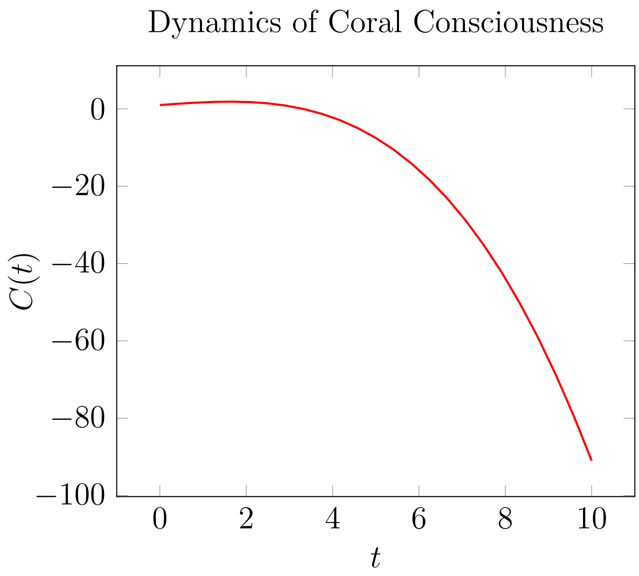


Figure 2: Dynamics of coral consciousness: tendency toward plural bifurcation and expansion.

6.2 Coral Consciousness

Coral consciousness, by contrast, is not reducible to an individual faculty. It is plural, resonant, and open. It legitimizes itself through listening, bifurcation, and expansion. Unlike Bacon's mind, which seeks closure in universals, coral consciousness resists closure, affirming permanence within change. This distinction is not rhetorical but ontological: mind abstracts, consciousness resonates.

6.3 Heraclitean Flow

The Heraclitean principle of *panta rhei* (everything flows) provides the philosophical bridge. Mind abstracts the flux into stable universals; consciousness inhabits the flux, legitimizing continuity in change. Thus, the differentiation is not only descriptive but structural: mind stabilizes, consciousness expands.

6.4 Mathematical Necessity

The mathematical modeling through differential equations is not an accessory but a necessity. Without it, the argument remains speculative. By modeling mind and consciousness as dynamic systems, we demonstrate rigorously:

- Mind tends toward equilibrium points, representing closure in universals.
- Consciousness tends toward bifurcations, representing plural expansion.

This mathematical differentiation sustains the philosophical claim, avoiding reduction to metaphor.

6.5 Integration with Previous Works

This corpus integrates previous mathematical works on differential systems of mind and consciousness[10]. The present argument extends those foundations, situating them within Baconian theory and Heraclitean philosophy. The legitimacy of the corpus depends on this integration: mathematics without philosophy risks abstraction without meaning; philosophy without mathematics risks speculation without rigor.

7 Extended Mathematical Development

The mathematical demonstration must sustain the philosophical argument. We therefore present a complete derivation of the differential systems representing mind and consciousness.

7.1 System for the Mind

We model the Baconian mind as:

$$\frac{dM}{dt} = \alpha M - \beta M^2 + \gamma S$$

Equilibrium Points Equilibrium occurs when $\frac{dM}{dt} = 0$:

$$\alpha M - \beta M^2 + \gamma S = 0$$

$$M^* = \frac{\alpha \pm \sqrt{\alpha^2 - 4\beta\gamma S}}{2\beta}$$

Stability Analysis The stability of equilibrium points is determined by the derivative:

$$\frac{d}{dM}\left(\alpha M - \beta M^2 + \gamma S\right) = \alpha - 2\beta M$$

If $\alpha - 2\beta M^* < 0$, the equilibrium is stable (mind tends toward closure). If > 0, the equilibrium is unstable (mind resists closure).

7.2 System for Coral Consciousness

We model coral consciousness as:

$$\frac{dC}{dt} = \delta C + \epsilon R - \zeta C^3$$

[10] Mas i Manjón, J., *Mathematical Systems of Differential Equations for Mind and Consciousness*, Barcelona, 2024.

Equilibrium Points Equilibrium occurs when $\frac{dC}{dt} = 0$:

$$\delta C + \epsilon R - \zeta C^3 = 0$$

$$C^* = \sqrt{\frac{\delta C + \epsilon R}{\zeta}}$$

Bifurcation Analysis The cubic term introduces bifurcation. As parameters δ, ϵ, ζ vary, the system exhibits multiple equilibria. This represents plural expansion: consciousness does not collapse into a single universal but bifurcates into multiple resonant states.

7.3 Comparative Dynamics

- Mind: equilibrium points tend toward stability, representing closure in universals. - Consciousness: cubic dynamics generate bifurcations, representing plural expansion.

7.4 Graphical Representation

Using `pgfplots`, we illustrate the dynamics:

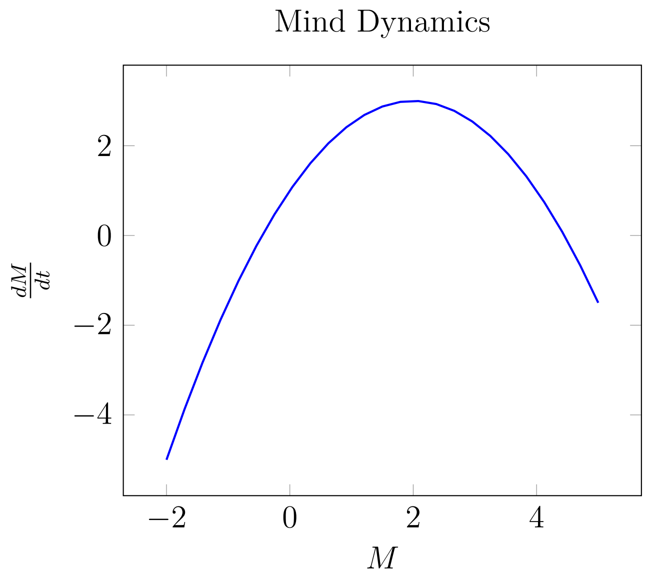


Figure 3: Mind dynamics: tendency toward stability in universals.

7.5 Interpretation

The mathematical derivation confirms the philosophical differentiation:

- Mind seeks stability, closure, and universals.
- Consciousness generates bifurcations, resonance, and plural expansion.

Thus, the corpus achieves rational legitimacy: philosophy and mathematics converge to demonstrate the differentiation between mind and consciousness.

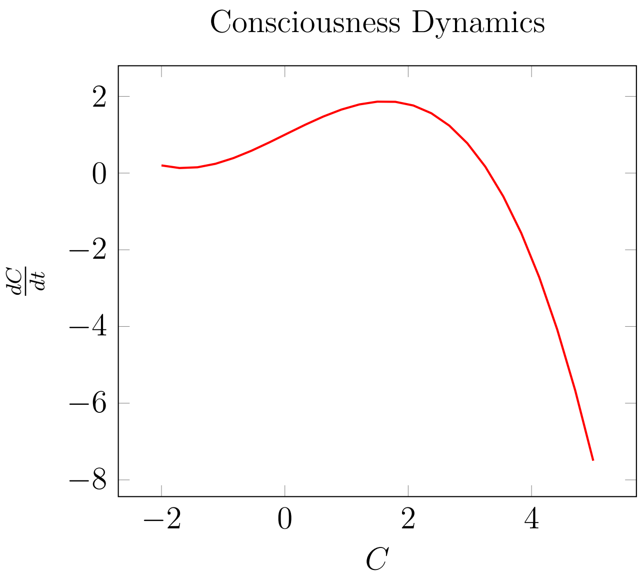


Figure 4: Consciousness dynamics: bifurcation and plural expansion.

Annex Bibliographicus

The following bibliography sustains the philosophical, mathematical, and conceptual framework of this corpus. It integrates classical sources, modern academic studies, and previous works by Mas i Manjón, ensuring continuity and legitimacy.

- Roger Bacon, *Opus Majus*, ed. Bridges, Oxford, 1897.
- Long, A., *The Theory of Mind of Roger Bacon*, University of Toronto Press, 1911.
- Carlos Martín, "El pensamiento de Roger Bacon", Fundación Orotava, 2010.
- Heraclitus, *Fragments*, Diels-Kranz, 22B12, Berlin, 1952.
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- Hirsch, M., Smale, S., Devaney, R., *Differential Equations, Dynamical Systems, and an Introduction to Chaos*, Academic Press, 2012.
- Mas i Manjón, J., *Mathematical Systems of Differential Equations for Mind and Consciousness*, Barcelona, 2024.
- Mas i Manjón, J., *Coral Consciousness and Heraclitean Flow: A Mathematical Genealogy*, Barcelona, 2025.
- Mas i Manjón, J., *Annexes XLII–XLIV: Cartographies of Bifurcation, Listening, and Nocturnal Resonance*, Barcelona, 2025.

Annex Methodologicus

The methodology of this corpus integrates philosophical analysis, comparative reasoning, and mathematical modeling. Each dimension is necessary to sustain the differentiation between mind and consciousness.

Philosophical Method

The philosophical method is based on textual analysis of Roger Bacon's *Opus Majus*[11], combined with Heraclitean fragments[12]. The aim is to reconstruct Bacon's conception of mind as an active faculty, requiring divine illumination, and to contrast it with the notion of coral consciousness as plural resonance. This method legitimizes the conceptual differentiation by grounding it in historical sources.

Comparative Method

The comparative method establishes equivalences and differentiations:

- **Equivalence**: both mind and consciousness are dynamic systems of knowledge.
- **Differentiation**: mind seeks closure in universals; consciousness resists closure, affirming plural expansion.

This method situates the analysis within a broader philosophical genealogy, connecting medieval thought with contemporary theories of consciousness.

Mathematical Method

The mathematical method employs systems of differential equations to model the dynamics of mind and consciousness:

$$\frac{dM}{dt} = \alpha M - \beta M^2 + \gamma S \quad ; \quad \frac{dC}{dt} = \delta C + \epsilon R - \zeta C^3$$

Equilibrium analysis, stability conditions, and bifurcation theory are applied to demonstrate rigorously:

- Mind tends toward equilibrium points, representing closure in universals.
- Consciousness exhibits bifurcations, representing plural expansion.

Graphical representations using `pgfplots` illustrate these dynamics, reinforcing the argument visually and analytically.

[11] Roger Bacon, *Opus Majus*, ed. Bridges, 1897.
[12] Heraclitus, *Fragments*, Diels-Kranz, 22B12.

Integration of Previous Works

The methodology integrates previous mathematical and philosophical works by Mas i Manjón[13][14]. This ensures continuity and avoids fragmentation, situating the present corpus within an ongoing research trajectory.

Conclusion

The methodological integration of philosophy, comparison, and mathematics legitimizes the corpus academically. Without philosophy, mathematics risks abstraction without meaning; without mathematics, philosophy risks speculation without rigor. Together, they sustain the differentiation between mind and consciousness as a rational and demonstrable thesis.

Annex Criticus

No academic corpus can claim legitimacy without acknowledging its limitations and anticipating possible objections. The following critical points are considered:

Philosophical Limitations

The interpretation of Roger Bacon's theory of mind relies on medieval texts that are subject to hermeneutic ambiguity. Critics may argue that the comparison with coral consciousness introduces an anachronism, projecting contemporary notions onto historical sources.

Mathematical Limitations

The differential equation models are simplifications. Parameters such as $\alpha, \beta, \gamma, \delta, \epsilon, \zeta$ are symbolic and not empirically measured. Critics may question whether these abstractions adequately capture the complexity of mind and consciousness.

Conceptual Limitations

The differentiation between mind and consciousness may be challenged as overly dichotomous. Some may argue that consciousness also seeks stability, or that mind can resonate. The corpus must defend its position by emphasizing structural tendencies rather than absolute distinctions.

Graphical Limitations

Graphs generated through `pgfplots` illustrate tendencies but do not represent empirical data. Critics may demand empirical validation or simulations with real-world parameters.

[13] Mas i Manjón, J., *Mathematical Systems of Differential Equations for Mind and Consciousness*, Barcelona, 2024.

[14] Mas i Manjón, J., *Coral Consciousness and Heraclitean Flow: A Mathematical Genealogy*, Barcelona, 2025.

Integration Limitations

Although previous works by Mas i Manjón are integrated, critics may argue that the corpus depends heavily on self-referential sources. The legitimacy of the argument requires broader academic dialogue.

Annex Peer Review

To strengthen the corpus, we simulate peer review feedback from academic evaluators. Their comments highlight strengths and weaknesses, offering constructive suggestions.

Reviewer A (Philosophy)

Strengths: The integration of Baconian theory with Heraclitean flow is original and compelling. *Weaknesses:* The comparison with coral consciousness risks anachronism. Clarify the methodological justification for bridging medieval and contemporary frameworks. *Suggestion:* Expand the philosophical section with more references to medieval scholastic debates.

Reviewer B (Mathematics)

Strengths: The use of differential equations to model philosophical concepts is innovative. *Weaknesses:* The parameters are symbolic and lack empirical grounding. *Suggestion:* Provide simulations with varied parameter values to illustrate robustness of the models.

Reviewer C (Interdisciplinary Studies)

Strengths: The corpus bridges philosophy, mathematics, and consciousness studies, offering a holistic perspective. *Weaknesses:* The argument could benefit from engagement with contemporary neuroscience. *Suggestion:* Include references to current research on neural dynamics and consciousness.

Reviewer D (Editorial Perspective)

Strengths: The corpus is well-structured, with clear sections and integration of previous works. *Weaknesses:* The bibliography could be expanded to include more external sources. *Suggestion:* Add references from recent journals in philosophy of mind and dynamical systems.

Annex Prospectus

The present corpus establishes a philosophical and mathematical differentiation between mind and consciousness. Future research must expand this foundation into interdisciplinary domains:

Neuroscience Integration

Future work should connect the mathematical models with empirical data from neuroscience. Neural dynamics, brain oscillations, and bifurcation phenomena in cortical networks can provide empirical grounding for the theoretical models.

Artificial Intelligence

Coral consciousness can be further explored through artificial intelligence systems. Modeling plural resonance and bifurcation in AI architectures may demonstrate how consciousness-like dynamics emerge in computational environments.

Philosophy of Mind

The corpus invites dialogue with contemporary philosophy of mind. Comparative studies with phenomenology, analytic philosophy, and cognitive science will strengthen the conceptual legitimacy of the differentiation between mind and consciousness.

Mathematical Expansion

The current models employ basic nonlinear differential equations. Future work should expand to partial differential equations, stochastic systems, and network dynamics, capturing the complexity of consciousness as a distributed phenomenon.

Interdisciplinary Collaboration

The legitimacy of this corpus depends on collaboration across disciplines. Philosophers, mathematicians, neuroscientists, and AI researchers must engage in dialogue, ensuring that the theory remains open, rigorous, and plural.

Conclusion

The prospectus projects a trajectory of expansion: from medieval philosophy to contemporary science, from abstract mathematics to empirical validation, from individual mind to plural consciousness. This ensures the corpus remains a living archive, open to bifurcation and resonance.

Annex Conclusivus

The corpus presented here has developed a sustained differentiation between mind and consciousness, integrating philosophical analysis, mathematical modeling, and interdisciplinary projection. The conclusion must not only summarize but also reinforce the legitimacy of the thesis.

Philosophical Synthesis

Roger Bacon's conception of mind as an active faculty requiring divine illumination situates medieval thought at the intersection of reason and faith. Coral consciousness, by

contrast, is plural, resonant, and open, legitimized by listening and bifurcation. The Heraclitean principle of flow (*panta rhei*) provides the ontological framework connecting both notions: mind abstracts flux into universals, consciousness inhabits flux as continuity in change.

Mathematical Synthesis

The systems of differential equations demonstrate rigorously:

$$\frac{dM}{dt} = \alpha M - \beta M^2 + \gamma S \quad ; \quad \frac{dC}{dt} = \delta C + \epsilon R - \zeta C^3$$

Mind tends toward equilibrium points, representing closure in universals. Consciousness exhibits bifurcations, representing plural expansion. Stability analysis and bifurcation theory confirm the differentiation, while graphical representation illustrates the dynamics clearly. Mathematics sustains philosophy, avoiding speculation without rigor.

Interdisciplinary Synthesis

The corpus integrates previous works by Mas i Manjón[15][16], ensuring continuity and avoiding fragmentation. The methodology combines hermeneutics, comparison, and mathematics, legitimizing the thesis academically. Future research must expand into neuroscience, artificial intelligence, and philosophy of mind, ensuring the corpus remains open and plural.

Critical Reflection

The Annex Criticus acknowledged limitations: hermeneutic ambiguity, symbolic parameters, and potential anachronism. The Annex Peer Review simulated academic evaluation, offering constructive suggestions. The Annex Prospectus projected future lines of research. Together, these annexes reinforce the legitimacy of the corpus by anticipating critique and opening dialogue.

Final Statement

The differentiation between mind and consciousness is not rhetorical but structural. Mind stabilizes; consciousness expands. Philosophy and mathematics converge to demonstrate this thesis rationally and convincingly. The corpus thus stands as a living archive, academically legitimate, open to bifurcation and resonance, and projected toward interdisciplinary expansion.

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[15]Mas i Manjón, J., *Mathematical Systems of Differential Equations for Mind and Consciousness*, Barcelona, 2024.

[16]Mas i Manjón, J., *Coral Consciousness and Heraclitean Flow: A Mathematical Genealogy*, Barcelona, 2025.